CLAIMS

What is claimed is:

1. A low loss transmit/receive switch for diversity antenna radio frequency applications, the low loss transmit/receive switch comprises:

first antenna capacitive coupling circuit operably coupled to a first antenna;

second antenna capacitive coupling circuit operably coupled to a second antenna;

antenna selection circuit operably coupled to enable the first or the second antenna in accordance with an antenna selection signal;

first inductive coupling circuit operably coupled to the first and second antenna capacitive coupling circuits and to an output of a power amplifier, wherein inductance of the first inductive coupling circuit is tuned with capacitance of the first and second antenna capacitive coupling circuits at a corresponding radio frequency; and

second inductive coupling circuit operably coupled to the first and second antenna capacitive coupling circuits and to an input of a low noise amplifier, wherein inductance of the second inductive coupling circuit is tuned with the capacitance of the first and second antenna capacitive coupling circuits at the corresponding radio frequency.

2. The low loss transmit/receive switch of claim 1, wherein the first inductive coupling circuit comprises:

first inductor having a first node and a second node, wherein the first node of the first inductor is operably coupled to receive a single-ended radio frequency signal from the output of the power amplifier; and

second inductor having a first node and a second node, wherein the first node of the second inductor is operably coupled to the second node of the first inductor, wherein the

second node of the second inductor is operably coupled to ground, and wherein the operable coupling of the first node of the second inductor to the second node of the first inductor is operably coupled to the first and second antenna capacitive coupling circuits.

3. The low loss transmit/receive switch of claim 1, wherein the second inductive coupling circuit comprises:

first inductor having a first node and a second node, wherein the first node of the first inductor is operably coupled to provide a single-ended radio frequency signal to the input of the low noise amplifier; and

second inductor having a first node and a second node, wherein the first node of the second inductor is operably coupled to the second node of the first inductor, wherein the second node of the second inductor is operably coupled to ground, and wherein the operable coupling of the first node of the second inductor to the second node of the first inductor is operably coupled to the first and second antenna capacitive coupling circuits.

4. The low loss transmit/receive switch of claim 1, wherein each of the first and second antenna capacitive coupling circuits comprises:

a first capacitor having a first node and a second node, wherein the first node of the first capacitor is operably coupled to the first or second inductive coupling circuit, respectively; wherein the second node of the first capacitor is operably coupled to the first antenna; and

a second capacitor having a first node and a second node, wherein the first node of the second capacitor is operably coupled to the first or second inductive coupling circuit, respectively; wherein the second node of the second capacitor is operably coupled to the second antenna.

5. The low loss transmit/receive switch of claim 1, wherein the antenna selection circuit comprises:

a first transistor having a gate, a drain, and a source, wherein the gate of the first transistor is operably coupled to receive the antenna selection signal, the source of the first transistor is operably coupled to the ground, and the drain of the first transistor is operably coupled to the first antenna; and

a second transistor having a gate, a drain, and a source, wherein the gate of the second transistor is operably coupled to receive the antenna selection signal, the source of the second transistor is operably coupled to the ground, and the drain of the second transistor is operably coupled to the second antenna, wherein, when the antenna selection signal is in a first state, the first transistor is enabled and when the antenna selection signal is in a second state, the second transistor is enabled.

6. A low loss transmit/receive switch for diversity antenna radio frequency applications, the low loss transmit/receive switch comprises:

a first inductor-capacitor circuit having a first node, a center node, and a second node, wherein the first node of the first inductor-capacitor circuit is operably coupled to an input of a low noise amplifier and the second node of the first inductor-capacitor circuit is operably coupled to a first antenna;

a second inductor-capacitor circuit having a first node, a center node, and a second node, wherein the first node of the second inductor-capacitor circuit is operably coupled to the input of the low noise amplifier and the second node of the second inductor-capacitor circuit is operably coupled to a second antenna;

a third inductor-capacitor circuit having a first node, a center node, and a second node, wherein the first node of the third inductor-capacitor circuit is operably coupled to an output of a power amplifier and the second node of the third inductor-capacitor circuit is operably coupled to the first antenna;

a fourth inductor-capacitor circuit having a first node, a center node, and a second node, wherein the first node of the fourth inductor-capacitor circuit is operably coupled to the output of the power amplifier and the second node of the fourth inductor-capacitor circuit is operably coupled to the second antenna;

a first transistor having a gate, a drain, and a source, wherein the gate of the first transistor is operably coupled to receive an antenna selection signal, the source of the first transistor is operably coupled to ground, and the drain of the first transistor is operably coupled to the center node of the first inductor-capacitor circuit;

a second transistor having a gate, a drain, and a source, wherein the gate of the second transistor is operably coupled to receive the antenna selection signal, the source of the

second transistor is operably coupled to the ground, and the drain of the second transistor is operably coupled to the center node of the second inductor-capacitor circuit;

a third transistor having a gate, a drain, and a source, wherein the gate of the third transistor is operably coupled to receive the antenna selection signal, the source of the third transistor is operably coupled to ground, and the drain of the third transistor is operably coupled to the center node of the third inductor-capacitor circuit;

a fourth transistor having a gate, a drain, and a source, wherein the gate of the fourth transistor is operably coupled to receive the antenna selection signal, the source of the fourth transistor is operably coupled to the ground, and the drain of the fourth transistor is operably coupled to the center node of the fourth inductor-capacitor circuit; wherein, when the antenna selection signal is in a first state, the first and third transistors are enabled and when the antenna selection signal is in a second state, the second and fourth transistors are enabled.

7. The low loss transmit/receive switch of claim 6, wherein each of the first, second, third, and fourth inductor-capacitor circuits comprises:

an inductor having an inductance value of approximately three nano-Henries; and

a capacitor having a capacitance value of approximately one pico-Farad.

8. A radio frequency integrated circuit (RFIC) comprises:

a receiver section operably coupled to convert inbound radio frequency (RF) signals into inbound baseband data, wherein the receiver section includes a low noise amplifier for receiving the inbound RF signal;

a transmitter section operably coupled to convert outbound baseband signals into outbound RF signals, wherein the transmitter section includes a power amplifier for transmitting the outbound RF signals; and

low loss transmit/receive switch operably coupled to the low noise amplifier and the power amplifier, wherein the low loss transmit/receive switch includes:

first antenna capacitive coupling circuit operably coupled to a first antenna;

second antenna capacitive coupling circuit operably coupled to a second antenna;

antenna selection circuit operably coupled to enable the first or the second antenna in accordance with an antenna selection signal;

first inductive coupling circuit operably coupled to the first and second antenna capacitive coupling circuits and to an output of the power amplifier, wherein inductance of the first inductive coupling circuit is tuned with capacitance of the first and second antenna capacitive coupling circuits at a corresponding radio frequency of the inbound and outbound RF signals; and

second inductive coupling circuit operably coupled to the first and second antenna capacitive coupling circuits and to an input of the low noise

amplifier, wherein inductance of the second inductive coupling circuit is tuned with the capacitance of the first and second antenna capacitive coupling circuits at the corresponding radio frequency.

9. The RFIC of claim 8, wherein the first inductive coupling circuit comprises:

first inductor having a first node and a second node, wherein the first node of the first inductor is operably coupled to receive a single-ended radio frequency signal from the output of the power amplifier; and

second inductor having a first node and a second node, wherein the first node of the second inductor is operably coupled to the second node of the first inductor, wherein the second node of the second inductor is operably coupled to ground, and wherein the operable coupling of the first node of the second inductor to the second node of the first inductor is operably coupled to the first and second antenna capacitive coupling circuits.

10. The RFIC of claim 8, wherein the second inductive coupling circuit comprises:

first inductor having a first node and a second node, wherein the first node of the first inductor is operably coupled to provide a single-ended radio frequency signal to the input of the low noise amplifier; and

second inductor having a first node and a second node, wherein the first node of the second inductor is operably coupled to the second node of the first inductor, wherein the second node of the second inductor is operably coupled to ground, and wherein the operable coupling of the first node of the second inductor to the second node of the first inductor is operably coupled to the first and second antenna capacitive coupling circuits.

11. The RFIC of claim 8, wherein each of the first and second antenna capacitive coupling circuits comprises:

a first capacitor having a first node and a second node, wherein the first node of the first capacitor is operably coupled to the first or second inductive coupling circuit, respectively; wherein the second node of the first capacitor is operably coupled to the first antenna; and

a second capacitor having a first node and a second node, wherein the first node of the second capacitor is operably coupled to the first or second inductive coupling circuit, respectively; wherein the second node of the second capacitor is operably coupled to the second antenna.

12. The RFIC of claim 8, wherein the antenna selection circuit comprises:

a first transistor having a gate, a drain, and a source, wherein the gate of the first transistor is operably coupled to receive the antenna selection signal, the source of the first transistor is operably coupled to the ground, and the drain of the first transistor is operably coupled to the first antenna; and

a second transistor having a gate, a drain, and a source, wherein the gate of the second transistor is operably coupled to receive the antenna selection signal, the source of the second transistor is operably coupled to the ground, and the drain of the second transistor is operably coupled to the second antenna, wherein, when the antenna selection signal is in a first state, the first transistor is enabled and when the antenna selection signal is in a second state, the second transistor is enabled.

13. A radio frequency integrated circuit (RFIC) comprises:

a receiver section operably coupled to convert inbound radio frequency (RF) signals into inbound baseband data, wherein the receiver section includes a low noise amplifier for receiving the inbound RF signal;

a transmitter section operably coupled to convert outbound baseband signals into outbound RF signals, wherein the transmitter section includes a power amplifier for transmitting the outbound RF signals; and

low loss transmit/receive switch operably coupled to the low noise amplifier and the power amplifier, wherein the low loss transmit/receive switch includes:

a first inductor-capacitor circuit having a first node, a center node, and a second node, wherein the first node of the first inductor-capacitor circuit is operably coupled to an input of the low noise amplifier and the second node of the first inductor-capacitor circuit is operably coupled to a first antenna;

a second inductor-capacitor circuit having a first node, a center node, and a second node, wherein the first node of the second inductor-capacitor circuit is operably coupled to the input of the low noise amplifier and the second node of the second inductor-capacitor circuit is operably coupled to a second antenna;

a third inductor-capacitor circuit having a first node, a center node, and a second node, wherein the first node of the third inductor-capacitor circuit is operably coupled to an output of the power amplifier and the second node of the third inductor-capacitor circuit is operably coupled to the first antenna;

a fourth inductor-capacitor circuit having a first node, a center node, and a second node, wherein the first node of the fourth inductor-capacitor circuit is operably coupled to the output of the power amplifier and the second

node of the fourth inductor-capacitor circuit is operably coupled to the second antenna;

a first transistor having a gate, a drain, and a source, wherein the gate of the first transistor is operably coupled to receive an antenna selection signal, the source of the first transistor is operably coupled to ground, and the drain of the first transistor is operably coupled to the center node of the first inductor-capacitor circuit;

a second transistor having a gate, a drain, and a source, wherein the gate of the second transistor is operably coupled to receive the antenna selection signal, the source of the second transistor is operably coupled to the ground, and the drain of the second transistor is operably coupled to the center node of the second inductor-capacitor circuit;

a third transistor having a gate, a drain, and a source, wherein the gate of the third transistor is operably coupled to receive the antenna selection signal, the source of the third transistor is operably coupled to ground, and the drain of the third transistor is operably coupled to the center node of the third inductor-capacitor circuit;

a fourth transistor having a gate, a drain, and a source, wherein the gate of the fourth transistor is operably coupled to receive the antenna selection signal, the source of the fourth transistor is operably coupled to the ground, and the drain of the fourth transistor is operably coupled to the center node of the fourth inductor-capacitor circuit; wherein, when the antenna selection signal is in a first state, the first and third transistors are enabled and when the antenna selection signal is in a second state, the second and fourth transistors are enabled.

14. The RFIC of claim 13, wherein each of the first, second, third, and fourth inductor-capacitor circuits comprises:

an inductor having an inductance value of approximately three nano-Henries; and

a capacitor having a capacitance value of approximately one pico-Farad.